Water Quality

SP 392-D

Well Disinfection Using Laundry Bleach

*Timothy N. Burcham, former Assistant Professor, Agricultural Engineering
and C. Roland Mote, Assistant Dean, Agricultural Experiment Station*

If you use a private water supply (well), then your water should be tested at least annually for bacterial contamination. If coliform bacteria are present, then you should clean and disinfect the well with a treatment that is often called **shock chlorination.** It can be done using ordinary household laundry bleach. Laundry bleach contains about 5.25 percent sodium hypochlorite (a form of chlorine). Chlorine is used to treat municipal water supplies and is very effective in killing bacteria and certain viruses.

The term "shock chlorination" is very descriptive, since concentrations of chlorine ranging from 50 to 200 milligrams per liter are used in the procedure. This is many times the amount of chlorine used in municipal water supplies. In addition to killing potentially harmful bacteria and viruses, a **super shock chlorination** (greater than 800 mg/liter hypochlorite) can also be effective in reducing **iron bacteria** (*Sideromonas* Cholodny). Iron bacteria are natually occurring and do not cause disease, but do form a reddish brown slime (ferric hydroxide) that coats the inside of pipes and plumbing fixtures. These deposits may clog watering devices

which have small openings and reduce performance of pumps. Iron bacteria should not be confused with iron dissolved in water. Dissolved iron causes red stains on clothing and plumbing fixtures and is affected very little by shock chlorination.

While municipal water supplies always have low levels of chlorine present to kill bacteria, the shock chlorination procedure is used to disinfect private water supplies on an "as needed" basis. Once the "shocking" period (12 to 24 hours) is over, the highly chlorinated water is flushed from the plumbing system onto the ground using outdoor faucets. Household water use should be kept to an absolute minimum during the shock chlorination procedure.

The amount of water in a well determines the amount of chlorine solution needed for proper disinfection. Table 1 lists proper amounts of **common laundry bleach** to use in performing the shock chlorination procedure. **Remember, Table 1 is for the height of the column of standing water in the well.** To find the height of water column in your well, subtract the distance to the top of the water in the well from the total depth of the well.

Table 1. Amount of laundry bleach (5.25 percent sodium hypochlorite)* needed for shock chlorination[1]

Height of Water Standing in Well (feet)	Casing Diameter				
	4-inch	6-inch	8-inch	10-inch	12-inch
10	1/2 cup	1 cup	1-1/2 cup	1 pint	2 pints
25	1 cup	1 pint	2 pints	3 pints	4-1/2 pints
50	1 pint	1 quart	2 quarts	3 quarts	1 gallon
100	1 quart	2 quarts	1 gallon	1-1/2 gallons	2 gallons
150	3 pints	3 quarts	1-1/2 gallons	2 gallons	3 gallons

*Addition of this amount of laundry bleach (5.25 percent sodium hypochlorite) will provide the USEPA recommended concentration of 100 milligrams per liter of available chlorine.

_____

[1]For super shock chlorination multiply values in Table 1 by eight to obtain a concentration of 800 mg per liter of available chlorine.

Example: A well has a 6-inch casing diameter and a depth of 137 feet. The distance from the top of the well to the water level is 94 feet. Find the amount of laundry bleach required to disinfect the well.

Solution: First compute the height of water standing in the well by subtracting the distance to the water level from the well depth (137 feet – 94 feet = 43 feet). In table 1 find the column for a 6-inch well. The standing water level of 43 feet is between table values of 25 and 50 feet of standing water, therefore we will use the row corresponding to 50 feet of standing water to determine the amount of bleach to add. Table 1 indicates that one quart of laundry bleach will supply the EPA recommended concentration of 100 mg/liter of available chlorine.

If the height of standing water in your well exceeds 150 feet, then use the following simple formula to determine the correct amount ot laundry bleach to use for a well with a 6-inch casing. (Note: *Formula A* **is valid for 6 inch casings only.** If your well casing is larger or smaller than 6 inches, use formulas provided in the **Appendix** to calculate the proper amount of laundry bleach for disinfection.)

Helpful Conversions

8 ounces	1 cup
32 ounces	1 quart
128 ounces	1 gallon

Formula A **(6 inch well):**
0.54 x [Height of Water in the Well]
= _____ **ounces.**

Example: A well with a 6 inch casing is 452 feet deep. The distance from the top of the well to water level is 105 feet. Find the amount of laundry bleach to use for proper shock chlorination.

Solution: Since this is a 6-inch well, *Formula A* is applicable. The height of water standing the well is found by subtracting the distance to the water level from the well depth (452 feet – 105 feet = 347 feet). **0.54 x [347 feet of standing water] = 187.4 ounces.** Since there are 128 ounces in one gallon, we divide 187.4 by 128 to get 1.46 gallons. That is approximately one and half gallons, so use that amount of laundry bleach to disinfect the well.

Most water treatment equipment such as water softeners, iron filters and sand filters, should also be shock chlorinated. Check the manufacturer's literature before chlorinating treatment equipment and pressure tanks to determine the applicability of shock chlorination to that system. Administering shock chlorination against manufacturer's recommendations may void your warranty.

Before You Begin

- **Do not** chlorinate activated carbon or charcoal filters. These filters will adsorb the chlorine, greatly reducing the life of the filter. If an activated carbon filter system is in place, turn the selector valve to the "Bypass" position before beginning the shock chlorination procedure. This routes the highly chlorinated water around the filter. After the shock chlorination procedure is completed, turn the selector valve to the "On" position to continue normal operation of this filter.
- **Be careful** when handling concentrated chlorine solutions. Wear rubber gloves, goggles, and a protective apron when handling chlorine solutions. If the chlorine solution accidentally gets on your skin, flush immediately with clean water.
- **Never mix** chlorine solutions with other cleaning agents, **especially ammonia**, because toxic gases may be formed.
- **Do not use** "Fresh-Scent" bleach or other special laundry products to disinfect wells. Use inexpensive "plain" laundry bleach with a 5.25 percent sodium hypochlorite content for disinfecting wells.

Shock Chlorination Procedure

1) Obtain and store enough clean drinking water to supply your household for at least 24 hours.
2) From Table 1, *Formula A* or the *Appendix*, determine the proper amount of laundry bleach to disinfect the well. Mix that amount of bleach with water in a large container (five gallons) and pour the solution **directly** into the well.
3) Turn on the outdoor faucet nearest the well and let the water run until a strong odor of chlorine is detected. If a strong odor is not detected, add more chlorine bleach directly into the well until the chlorine odor is evident.
4) Turn the faucet off. Route a garden hose from the faucet to the well.

5) Attach a spray nozzle to the end of the hose and turn the faucet back on. **Thoroughly** wash down the entire inside surface of the well casing with the sprayer nozzle for at least **10 minutes**.
6) After thoroughly washing down the inside of the well casing with the garden hose, turn on the remaining outdoor and indoor faucets one at a time until a strong chlorine odor is detected at each location. Close each faucet as soon as this odor is detected. (This ensures that the bacteria-killing chlorine solution is in all of the plumbing associated with the well.)
7) Let the chlorinated water stand in the water system pipes for **at least 12 to 24 hours. Do not drink the water from your well during this period. You may flush the toilets, but try to minimize the number of flushes.** Place reminder ribbons on all indoor and outdoor faucets and caution guests that they should use the stored water for drinking purposes.
8) After the chlorinated water has remained in the pipes for 12 to 24 hours, completely flush the system of remaining chlorine by turning on all of the outdoor faucets and letting them **run until** the chlorine smell dissipates. **Do not** turn on any of the indoor faucets until the strong chlorine smell has dissipated from the outdoor faucets. This will prevent undue loading on the septic tank system which can be damaged by the high chlorine concentration.
9) Finally, turn on indoor faucets and let run until the chlorine smell dissipates. The water system is now completely flushed and ready for normal usage. A residual chlorine odor and taste **may** persist in your water for a few days.

Wait one to two weeks and have the well water tested again for coliform bactria. You may have this done through your local health department or by a private laboratory. If coliform bacteria are still present after administering the shock chlorination procedure, then a continuous disinfection system may be necessary.

If you have questions about the bacterial tests results from your well, contact your local health office. Your county Extension personnel can provide information on protecting your well against bacterial contamination.

APPENDIX
Formulas for Calculating Proper Amount of Laundry Bleach for Shock Chlorination

Table 2. Volume of water per linear foot for various well diameters

Diameter (inches)	Volume (gal/ft)	Diameter (inches)	Volume (gal/ft)	Diameter (inches)	Volume (gal/ft)
4	0.65	15	9.18	27	29.74
6	1.47	16	10.44	30	36.72
8	2.61	18	13.22	36	52.88
10	4.08	20	16.32	42	71.97
12	5.88	22	19.75	48	94.00

Procedure: Find the volume of water per linear foot for the well casing diameter in question. Place that value in *Formula B.*

Formula B {Height of standing water in well (feet) x {Volume (gal/ft) from Table 2}
= _____ gallons

To compute the number of fluid ounces of laundry bleach required to achieve an available chlorine concentration of 100 mg/liter, take the answer from *Formula B* and place it in *Formula C.*

Formula C {Answer from *Formula B*} x {0.368 (ounces/gallon)}
= _____ ounces

Example: An individual has a well with a **4-inch** casing diameter. The well has **142** feet of standing water. Find the number of ounces required to treat the well.

Solution: First find the volume of water per linear foot from Table 2. The well has a 4-inch diameter casing, so Table 2 gives a value of **0.65 gal/ft**. Now place this number (**0.65**) in *Forumla B* as shown below:

Formula B — {142 (ft) of water} x {0.65 (gal/ft)} = **92.3 gallons**

Now place this answer (**92.3**) in *Formula C* as shown below:

Formula C — {92.3 gallons} x {0.368 ounces/gallon} = **34.0 ounces**

Use **34** ounces (about one quart) for proper disinfection.